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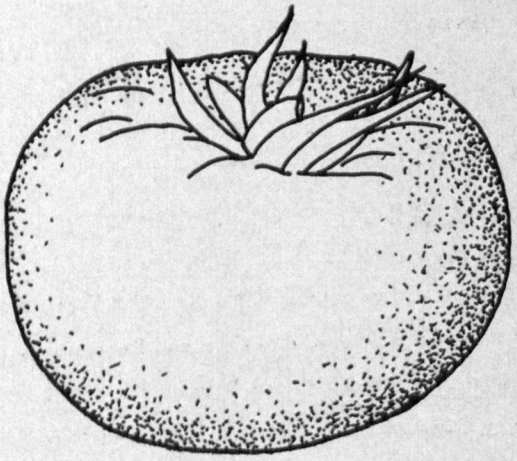

Average cost per pound: 1¼ cents

The farmers obtaining high yields and lower than average costs:

1. Planted at least 6,000 plants per farm.
2. Used home-grown plants.
3. Set their plants in early March instead of April.
4. Set their plants at least 24 inches apart in 5- or 6-foot rows.
5. Used at least 180 pounds of commercial fertilizer per thousand plants set.
6. Used dusts and sprays to control insects and plant diseases.

LOUISIANA STATE UNIVERSITY
AND
AGRICULTURAL AND MECHANICAL COLLEGE
AGRICULTURAL EXPERIMENT STATIONS
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A COST OF PRODUCTION STUDY OF TOMATOES IN NORTH LOUISIANA, 1939

T. M. MONTGOMERY, JR., AND J. NORMAN EFFERSON*

INTRODUCTION

The objectives of this study of the tomato enterprise in North Louisiana were as follows: (1) to describe the important items of cost and of return to the enterprise and to analyze variations in these items on different farms; (2) to set up standards of efficiency in production by which individual farmers may judge the effectiveness of their own methods so as to determine the strong and weak points of the business; and (3) to study the factors affecting efficiency and profits on tomatoes.

Although all factors influencing the costs of and the returns from tomato production are not subject to change by the individual farmer, many important ones are under human control. The economic factors which the farmer may influence by his management are analyzed in an attempt to show why some farmers were more successful than others.

METHOD AND SCOPE OF THE STUDY

Detailed records concerning the costs of and returns from the tomato enterprise and more general information about the entire farm business were obtained in August, 1939, from 181 farmers in Jackson, Winn, Caldwell, and Bienville parishes. A trained enumerator visited each farm and recorded careful estimates as obtained from the farmer's records and his knowledge of his operations for the 1939 crop year. The 181 farms were selected at random in order to obtain a representative sample or average picture of the area. This survey was conducted by the Louisiana Agricultural Experiment Station.

COSTS OF AND RETURNS FROM TOMATOES

On these 181 farms, 29 per cent of all cash farm receipts for the year were from tomatoes. The average tomato acreage on each farm was slightly more than one acre, since there were 201 acres included in the entire group, with a total yield of 1,380,440 pounds of tomatoes. The farms averaged 5,400 plants set and 7,627 pounds of tomatoes per farm, or 1,403 pounds of tomatoes per thousand plants set. Most farmers set approximately 5,000 plants per acre.

* The authors wish to acknowledge their indebtedness to Messrs. Joe Costa and Warren Savant, who assisted in collecting the information from the cooperating farmers, and to the farmers who supplied records to make this study possible.

Total costs of producing tomatoes averaged $95.09 per farm, $17.49 per thousand plants set, or $24.94 per ton of tomatoes produced. Growing and caring for plants in the seedbeds made up 24 per cent of these costs; growing costs in the field were 57 per cent; and harvesting and marketing costs accounted for the remaining 19 per cent. Man labor, manure, and fertilizer comprised two-thirds of all costs. Man labor was the chief cost in tomato production. On the 181 farms studied, 48 per cent of the total costs were labor charges.

The detailed costs and returns from tomato production on the 181 farms are shown in Table 1. The various costs are classified into three groups: seedbed costs, growing costs, and harvesting and marketing costs. Seedbed costs are incurred previous to setting the plants in the field, and growing costs include all other costs up to harvesting. The returns come from three sources: tomatoes sold, plants sold, and tomatoes used by the farm family.

In this analysis, the costs of producing tomatoes were calculated according to the most commonly followed cost accounting procedure. Those costs expended entirely on the tomato crop were charged directly to the crop and all indirect costs, such as the use of land, buildings, and equipment, were allocated according to the proportion of use on the tomato enterprise.

Seedbed Costs

Seedbed costs averaged $27.95 per farm, $4.22 per thousand plants set, or $6.02 per ton of tomatoes produced. On the seedbeds, an average of 88 hours of man labor was required per farm, 16 hours per thousand plants set, or 23 hours per ton of tomatoes produced. The cost of man labor on the seedbeds made up 9 per cent of all costs and 39 per cent of the seedbed costs. The labor was utilized in preparing the hotbeds, planting the seed, watering and caring for the plants, preparing the cold frame bed, transferring the plants to the cold frame, watering and caring for the plants in the cold frame, and dusting and spraying. The cost of man labor was charged at the rate of 10 cents per hour, which is near the average wage paid for such labor in the parishes surveyed.

The cost of seeds and plants amounted to 4 per cent of all costs and 17 per cent of the seedbed costs. Farmers usually paid 25 cents per ounce for seed and one dollar per thousand for plants. The Master Marglobe is the standard variety in the area, with the seeds being obtained from Corpus Christi, Texas, through the local agricultural agent of the railroad, and plants being purchased from neighboring plant growers. In general, about .7 of an ounce of seed was needed to produce a thousand plants. About half of the farmers grew their own plants, the others depending upon hased plants.

Hotbed costs were $3.23 per farm, 59 cents per thousand plants set, or 85 cents per ton of tomatoes produced. Hotbed costs amounted to 3 per cent of all costs and 14 per cent of the seedbed costs. These costs included lumber and nails, sheets or cloth, labor for building or repairing the bed, depreciation on the structure, 5 per cent interest charge, and heating costs. Almost all of the pro-

TABLE 1. AVERAGE COSTS OF AND RETURNS FROM TOMATOES, 181 FARMS, JACKSON, WINN, CALDWELL, AND BIENVILLE PARISHES, LOUISIANA, 1939

	Per thousand plants set		Per ton produced		Proportion of	
	Amount	Value	Amount	Value	Each Group	Total
	Number	Dollars	Number	Dollars	Per cent	Per cent
Seedbed costs:						
Man labor (hrs.)	16.2	1.62	23.1	2.31	39	9
Horse labor (hrs.)	.9	.09	1.3	.14	2	1
Seed purchased (ozs.)	1.3	.31	1.9	.44	7	2
Plants purchased	500	.44	700	.62	10	2
Hotbed costs	....	.59	....	.85	14	3
Cold frame costs	....	.85	....	1.20	20	5
Manure (lbs.)	105	.11	149	.16	3	1
Fertilizer (lbs.)	12	.20	18	.29	5	1
Dusts and sprays	....	.01	....	.01	...	...
Total	....	4.22	....	6.02	100	24
Growing costs:						
Man labor (hrs.)	48.8	4.88	69.5	6.95	49	28
Horse labor (hrs.)	11.0	1.16	15.6	1.64	12	7
Manure (lbs.)	111	.12	158	.17	1	1
Fertilizer (lbs.)	160	2.82	228	4.02	28	16
Dusts and sprays	....	.11	....	.16	1	1
Stakes	....	.23	....	.34	3	1
Ties	....	.23	....	.33	2	1
Picking-crates	....	.13	....	.19	1	1
Machinery costs	....	.03	....	.04	...	...
Land costs	....	.23	....	.33	3	1
Total	....	9.94	....	14.17	100	57
Harvest and market costs:						
Man labor (hrs.)	18.9	1.89	27.0	2.70	56	11
Horse labor (hrs.)	.2	.02	.2	.02	1	...
Truck and auto costs	....	.89	....	1.27	27	5
Hauling	....	.53	....	.76	16	3
Total	....	3.33	....	4.75	100	19
TOTAL COSTS	....	17.49	....	24.94	...	100
Returns:						
Tomatoes sold (lbs.)	1303	27.65	1858	39.41	91	...
Plants sold	1300	1.33	1900	1.89	4	...
Family use (lbs.)	100	1.45	142	2.07	5	...
TOTAL RETURNS	....	30.43	....	43.37	100	..
Net gain	....	12.93	....	18.43	...	...
Total labor	83.9	8.39	119.6	11.96	...	...
Return to labor	....	21.32	....	30.39	...	...

Number plants set per farm: 5400. Yield in lbs. per 1000 plants: 1403.

ducers used manure for heat in excavated permanent hotbeds. Some producers equipped their beds with flues and burned wood for heat during cold spells.

Cold frame costs were 5 per cent of the total costs and 20 per cent of the seedbed costs, with an average of $4.60 per farm, 85 cents per thousand plants set, or $1.20 per ton of tomatoes produced. These costs included lumber and nails, sheets or cloth, labor, depreciation, and a 5 per cent interest charge. All plants, including those grown by the farmer and those purchased from others, were placed in the cold frame for hardening before being set in the field.

Almost all farmers used manure on the plants while they were in the cold frame; very few used commercial fertilizer. The cost of manure and fertilizer amounted to 2 per cent of the total costs and 8 per cent of the seedbed costs. Few farmers used dusts or sprays on the tomato plants while they were still in the seedbeds.

Growing Costs

Growing costs were 57 per cent of the total costs, with an average of $54.02 per farm, $9.94 per thousand plants set, or $14.17 per ton of tomatoes produced. The cost of man labor was 49 per cent of the growing costs and 28 per cent of the total costs. An average of 265 hours of man labor per farm was required in growing the crop, or 49 hours per thousand plants set, and 70 hours per ton of tomatoes produced. Transferring the plants from the cold frame and setting them in the field required 20 per cent of all the labor spent for growing; sticking and tying the plants, 30 per cent; and pruning, 25 per cent.

The cost of horse labor for growing the tomatoes was estimated as 7 per cent of the total costs and 12 per cent of the growing costs. Since no special machinery is needed for tomato production, only a small charge was made against the crop for the use of regular farm equipment. Actual rent paid, or a 5 per cent interest charge on owned land, was included as a cost of the tomato acreage.

All farmers fertilized the field crop, using principally commercial fertilizer. The cost of fertilizer and manure made up 29 per cent of the growing costs, with an average of $2.82 per thousand plants set. The fertilizer mixtures most commonly used were 4-8-4 and 6-10-7. About half the farmers either dusted or sprayed. Calcium arsenate was used for dusting and a mixture of lime with copper sulfate or arsenate of lead was used as a spray.

Harvesting and Marketing Costs

Harvesting and marketing costs were 19 per cent of all costs on the 181 farms, with an average of $18.12 per farm, $3.33 per thousand plants set, or $4.75 per ton of tomatoes produced. Man

labor was the most expensive item, being 56 per cent of the harvesting and marketing costs. An average of 103 hours of man labor was required per farm, 19 hours per thousand plants set, or 27 hours per ton of tomatoes produced. Horse labor, power equipment, and hauling charges made up the balance of the harvesting costs.

Returns from Tomatoes

An average of 7,085 pounds of tomatoes were sold per farm, or 1,303 pounds per thousand plants set. The average price received per pound of tomatoes sold was 2.1 cents. Shippers bought 86 per cent of the tomatoes sold, truckers took 3 per cent, the cannery at Hodge 4 per cent, and the farmers peddled the remaining 7 per cent in neighboring towns. The shippers took the best tomatoes as green wraps, with the culls being sold to the cannery or to truckers.

Gross receipts from the tomato enterprise averaged $165.39 per farm, $30.43 per thousand plants set, or $43.37 per ton of tomatoes produced. The commercial sales made up 91 per cent of these receipts, with the remaining 9 per cent coming from family use of tomatoes and from plants sold.

The average net gain, or the returns less all costs including labor, was $70.30 per farm, $12.93 per thousand plants set, or $18.43 per ton of tomatoes produced. Forty-four, or 25 per cent of the 181 farmers, experienced a net loss. On the average, the farmers made 25.4 cents return per hour of labor spent on the tomato enterprise. This return per hour includes the cost of labor charged to the enterprise plus the net gain. Only six farmers had a minus return per hour of labor, and 22 farmers received over 50 cents per hour spent on tomato production.

FACTORS AFFECTING THE COSTS OF AND RETURNS FROM TOMATOES

Although the average cost of producing tomatoes was about $25 per ton, or one and one-fourth cents per pound, all farmers did not have the same costs or the same returns. Ten per cent of the farmers studied grew tomatoes at a profit of more than $30 per ton while 25 per cent of the 181 producers lost money on the enterprise. These farmers had to pay about the same price for fertilizer and labor and had the same weather conditions, yet there was a wide variation between individual farms in the costs and returns for the tomato enterprise.

In order to determine what factors were important in obtaining low costs and high returns in tomato production, a detailed study of the data was made to find out what happened to costs and returns under different conditions. The analysis of the more important factors affecting costs and returns in the central Louisiana tomato area are shown in Table 2.

TABLE 2. RELATION OF VARIOUS FACTORS TO COSTS OF AND RETURNS FROM TOMATOES, 181 FARMS, JACKSON, WINN, CALDWELL, AND BIENVILLE PARISHES, LOUISIANA, 1939

	Number of farms	Number of plants set	Yield per thousand plants set	Costs and returns per thousand plants set					
				Seed-bed costs	Growing costs	Harvesting and marketing costs	Total costs	Total returns	Net gain
	Number	Number	Pounds	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Number of plants set:									
Less than 4,000	61	2800	1280	6.13	10.69	4.47	21.29	28.91	7.62
4,000 to 5,999	70	4800	1330	4.25	10.07	3.21	17.53	29.06	11.53
6,000 or more	50	9500	1498	3.52	9.58	3.01	16.11	31.93	15.82
Yield per thousand plants set:									
Less than 1,000 pounds	58	4900	703	4.84	9.00	3.21	17.05	16.01	—1.04
1,000 to 1,499 pounds	62	5400	1216	3.71	9.96	3.11	16.78	24.95	8.17
1,500 or more pounds	61	6100	2105	4.21	10.63	3.62	18.46	46.34	27.88
Price received per pound:									
Less than 2 cents	46	5700	1309	3.91	10.06	3.15	17.12	21.89	4.77
2 to 2.3 cents	78	5400	1578	4.56	9.80	3.40	17.76	34.98	17.22
2.4 cents or more	57	5300	1243	4.01	10.02	3.41	17.44	31.51	14.07

Relation of the Size of the Enterprise to Costs and Returns

The larger the size of the tomato enterprise, as measured by the number of plants set, the lower were the costs of production and the greater were the net returns. Growers with less than 4,000 plants set per farm had costs of $21 per thousand plants set while those cultivating 6,000 or more plants per farm had costs of only $16 per thousand. The net gain per thousand plants set varied from about $8 for the farmers with small tomato enterprises to $16 for those with relatively large-sized units.

Lower costs and higher returns on the farms with relatively large units of the tomato enterprise were due to the increased efficiency of operation and savings that were obtained with the larger volume of business. The farms with large acreages made more efficient use of the equipment, horses, and man labor by being able to spread these costs over a larger unit of operation.

In addition to the higher returns per thousand plants set and per ton, the producers with larger acreages made greater returns per farm owing to the larger volume of business. These results illustrate the basic farm management principle that if a farmer is to obtain the greatest possible income from his operations, he must have a size of business large enough to keep himself and his family busy throughout the year.

Relation of Tomato Yields to Costs and Returns

The higher the yield of tomatoes per thousand plants set, the lower were the costs per pound and the greater were the net returns from the tomato enterprise. The growers who produced less than 1,000 pounds of tomatoes per thousand plants set had total costs as high as the farmers obtaining 1,500 pounds or more, but those with low production rates had a net loss of $1 per thousand plants while the high-production group made a profit of $28 per thousand plants set.

The fact that the farmers with high yields did not have larger expenses for growing the crop indicates that these high yields were not obtained by large increases in cash expenditures but were obtained by management practices and skills in growing the crop.

Relation of Prices Received for Tomatoes to Costs and Returns

In general, the higher the price received per pound for tomatoes, the greater were the net returns from the enterprise. The producers receiving less than 2 cents per pound for tomatoes sold made a net return of about $5 per thousand plants set as compared with $17 per thousand plants for those receiving more than

2 cents per pound. The growers obtaining higher prices did not have higher costs of production; thus all of the increase in price resulted in a net increase in earnings.

Some farmers received higher prices than others because they produced more tomatoes during the earlier part of the season when prices were high. The data indicated a tendency for the production of early tomatoes to be associated with early setting of plants and better than average care during the growing season. Also, there was a definite relationship between the method of marketing and prices received. The growers studied received an average price of 2.4 cents per pound for tomatoes sold to local tomato shippers, 1.3 cents per pound for tomatoes peddled to local consumers, .9 cents per pound for tomatoes sold to truckers, and .5 cents per pound for tomatoes sold to canneries.

FACTORS AFFECTING TOMATO YIELDS

Since the yield of tomatoes is the most important factor determining costs, all things which tend to increase yields at a reasonable cost should be given special consideration. Many of the factors affecting yields, however, are physical ones and are not within the scope of an economic investigation. Some of the factors are adapted to a statistical analysis, and the data indicated a wide variation of results depending upon the application of these factors on the farms studied in 1939.

The relation between these various factors and the yield per acre of tomatoes is shown in Table 3. Because of wide variation in climatic and marketing conditions from year to year, yield results for any one year do not give a picture sufficiently accurate that long time conclusions can be made. Within a fairly uniform area, however, yield results do give an indication of probable trends, especially if climatic conditions for that year are normal.

Relation of the Amount of Fertilizer Applied, to Tomato Yields and Returns

Higher yields and larger net returns per thousand plants set and per ton resulted from larger than average applications of commercial fertilizer. The farms using less than 140 pounds of fertilizer per thousand plants set made average yields of 1,162 pounds of tomatoes as compared with 1,602 pounds per thousand plants set for those using 180 pounds or more of commercial fertilizer.

Growing costs and total costs per thousand plants increased with the heavier applications of fertilizer, but the higher yields obtained made returns increase more rapidly than costs. The farmers using small applications of fertilizer made an average net return of about $9 per thousand plants set as compared with $16 for those applying fairly heavy amounts of fertilizer.

Relation of the Use of Manure as Fertilizer to Tomato Yields and Net Returns

Farmers using manure as a fertilizer for tomatoes obtained lower yields and made lower returns than did those who did not use manure. The group using manure had an average yield of 1,263 pounds and net returns of $7 per thousand plants set as compared with a yield of 1,427 pounds and net returns of $14 for the group using no manure.

This result would probably not hold true in all years or in all cases. The manure used on the farms studied in 1939 was applied in March and April, during which time there was little or no rainfall; thus the benefits of the manure were probably retarded due to lack of sufficient moisture.

Relation of the Use of Dusts or Sprays to Tomato Yields and Net Returns

The farmers who used dusts or sprays to control insects and plant diseases obtained higher yields and made greater net returns than did those using no insect and disease control measures. Producers using dusts or sprays made average yields of 1,487 pounds and $14 net returns per thousand plants set as compared with a yield of 1,297 pounds and net returns of $11 for those practicing no insect and disease control measures.

TABLE 3. RELATION OF VARIOUS FACTORS TO TOMATO YIELDS, 181 FARMS, JACKSON, WINN, CALDWELL, AND BIENVILLE PARISHES, 1939

	Number of farms	Yield of tomatoes per thousand plants set	Net gain per thousand plants set
	Number	Pounds	Dollars
Amount of fertilizer applied per thousand plants set:			
Less than 140 pounds	64	1162	9.34
140 to 179 pounds	56	1484	13.92
180 pounds or more	61	1602	16.14
Use of manure:			
Farms using manure	27	1263	7.41
Farms not using manure	154	1427	13.66
Use of dusts or sprays:			
Farms using dusts or sprays	97	1487	14.28
Farms not using dusts or sprays	84	1297	11.23
Time of setting plants in the field:			
Plants set in March	68	1541	16.95
Plants set in April	113	1305	10.08
Spacing of plants in the field:			
Plants closely spaced	32	1144	8.87
Plants mediumly spaced	105	1415	12.77
Plants widely spaced	44	1531	15.84
Use of home-grown plants:			
Farms using home-grown plants	93	1501	16.69
Farms using purchased plants	88	1251	7.12

Relation of the Time of Setting the Plants in the Field to Tomato Yields and Net Returns

The earlier the plants were set in the field, after the last killing frost, the higher were the yields and the greater were the net returns. Farmers setting their plants in March made average yields of 1,541 pounds and net returns of $17 per thousand plants set as compared with 1,305 pounds and net returns of $10 for those setting their plants in April.

The higher yields obtained from the plants set in March were probably due to the larger production of these plants during the cool spring months, while the production of plants set in April was probably retarded because of the hot summer weather during the latter part of the growing season. Also, the plants set early matured sooner and thus the farmers were able to market a larger proportion of the crop at the higher early season prices, while the farmers with late tomatoes probably left part of their crop in the field because prices were not high enough to justify marketing that part of the crop.

Relation of the Spacing of the Plants in the Field to Tomato Yields and Net Returns

Farmers who practiced a fairly wide spacing of the plants in the field obtained higher yields and made greater returns than did those practicing close spacing. For plants closely spaced, the average yield was 1,144 pounds per thousand plants set as compared with 1,531 pounds on farms where the plants were widely spaced.

Plants were considered closely spaced if the rows were less than 5 feet apart and plants set less than 20 inches apart, or if the rows were 5 or 6 feet wide and the plants set less than 18 inches apart. Plants were considered mediumly spaced if the rows were less than 5 feet wide and the plants set more than 19 inches apart, or if the rows were 5 or 6 feet wide and the plants set from 18 to 20 inches apart. Plants were considered widely spaced if the rows were 5 or 6 feet wide and the plants set more than 24 inches apart, or if the rows were more than 6 feet wide.

Relation of the Use of Home-Grown Plants to Tomato Yields and Net Returns

Higher yields were obtained by the farmers who used plants they had produced on the farm. Those farmers who used home-grown plants obtained an average yield of 1,501 pounds of tomatoes per thousand plants set as compared with 1,251 pounds for the producers who purchased plants for their commercial tomato crop.

The difference in yields between the home-grown and the purchased plants indicates that the plants produced on the farm, transferred directly to the cold frame, and then directly to the field were stronger, healthier plants more adapted to the local climatic conditions than were the purchased plants.